Not Just Important — Critical

Watertightness is an essential trait of any onsite system tank. Here is a field-tested way to prevent leaks using a special clay called bentonite.

By Brian Rabe

The concept of watertightness in onsite system tanks is talked about in general terms quite often, and everyone would agree it is important. However, the specifics and details may not be getting enough attention.

Since I started working in this industry 24 years ago, I have seen too many instances where what looked tight during construction turned out to be less so when the rains started and the water table appeared. The testing criteria in the rules are focused on the tanks and piping, but the testing techniques and the consistency with which they are applied vary tremendously.

The impact of any leaks is potentially huge. Anyone who has worked with pressure distribution knows that a small hole (1/8-inch diameter) with only five feet of head will pass nearly half a gallon per minute. That is more than 700 gallons per day, or about three times the average usage of a typical residential system.

A couple of seemingly minor air pockets in the epoxy resulted in leaks (at least two steady streams can be seen in the picture). This amounted to thousands of gallons per day for a couple of weeks when the water table temporarily rose during a period of heavy rainfall.

Leaks that small can be hard to detect, but the impact on the system is tremendous. And the potential magnitude of the problem gets bigger in a hurry. I have seen leaks amounting to tens of thousands of gallons per day. Finding them can be a challenge.

Another point to remember is that places that allow water in during wet weather can let water out during dry weather. Exfiltration can represent as much of a risk to human health and the environment as infiltration.

A better approach

About 15 years ago, after seeing a number of tanks that leaked after initially passing a watertightness test, I developed an approach that I have used and expanded ever since. The initial experiences started with two-piece tanks that were assembled in the field.

Each manufacturer had its own seam design and sealing technique. Some worked better than others. But depending on workmanship and attention to detail, any one of them could turn into a leaker. I knew of a material commonly used in well construction, called bentonite, from working with my geologist colleagues.

Bentonite is a naturally occurring clay that has an extreme ability to swell when it absorbs water. It is used to create a seal along the well casing to prevent surface and near-surface sources of contamination from short-circuiting down the borehole to the aquifer.

Bentonite in place around riser connections and the field seam before backfill.

Initially, I started specifying a band (about 6 inches wide by 6 inches tall) all the way around field seams on tanks. This works great as an insurance policy against infiltration. I now also include specifications for factory seams (cold joints) and would recommend using it around any patches of cracks, rock pockets or other imperfections.

However, as one installer pointed out to me, it may not be as effective going the other direction (exfiltration). He is right. That is why the critical detail to remember is that bentonite is no substitute for proper initial construction (materials and workmanship). The bentonite is effective at sealing small cracks and other minor imperfections, but the

A good example of properly supported and bedded pipes with the risers and pipe penetrations reinforced with bentonite. Note that the field seam on the tanks has not yet had bentonite applied.

larger the opening and the greater the pressure, the less likely the bentonite will hold.

Eye on other components

Over time, I have seen numerous other instances where other underground elements of the system have experienced infiltration. Examples include pipe penetrations, both through the tanks and through the risers.

Grommets only start watertight if they are installed properly, and that includes creating a smooth hole of the proper dimensions, coupled with maintaining material cleanliness throughout the installation, followed by proper bedding and support throughout the backfilling process.

It doesn't take much of an imperfection to have a grommet end up a potential leaker from the start, and a little differential settling after the fact will only make matters worse. This applies to gasketed joints and rubber couplers on gravity piping, as well.

I began specifying the placement of bentonite around pipe penetrations a few years ago as insurance, but again, it is no substitute for proper workmanship.

Risers are another potential source of leaks. Even PVC riser material can have imperfections. I have seen ribbed risers (spiral type) weep at the factory seams, although I think that is rare. More often, I have seen leaks through the epoxy at connection points and splice joints. This is most often due to poor workmanship.

Close attention to detail is necessary to make sure that any air pockets in the epoxy are sought out and addressed. It is far easier to get it right during the initial installation than to have to dig it up, often in less than ideal conditions, to fix it.

Care needs to be taken during storage of riser stock, since it doesn't take much time on a hot summer day for the material to become distorted (out of round) if lying on its side. This results in a tight fit for a portion of the joint, where there ends up being very little epoxy, coupled with very large gaps elsewhere that must be filled with epoxy.

Keep it shallow

It is also critical to allow enough time for the epoxy to cure to sufficient strength before applying sources of stress, such as installing splice boxes, installing hose and valve assemblies or backfilling. I also specify a ring of bentonite around riser joints and splices, just in case.

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Another good reason to make sure the materials and workmanship are the best they can be, before applying bentonite for insurance, is repair conditions. If you ever have to dig into the area where the bentonite is, it will be a sticky, gooey mess. If you can, it is always best to install system components as shallow as possible to reduce the exposure of potential sources of leaks to the water table, and to limit the driving force (head or pressure) that affects the rate of flow.

About the author

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